AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application.

Listing of Claims:

1. (Currently Amended) A tool for determining the amount of a carbon isotope in a fluid, comprising:

a laser source emitting at least one laser beam;

a first volume of the fluid positioned so that at least a first portion of a laser beam passes through the fluid;

a first downstream optical detector positioned to detect said first beam portion after said first beam portion passes through said first volume, said first optical detector emitting a first downstream signal corresponding to the strength of said first beam portion after passing through the first volume;

a reference cell containing a ~~known~~ concentration of the isotope and positioned so that at least a second portion of a laser beam passes through said <u>concentration</u>~~known composition~~;

a second downstream optical detector positioned to detect said second beam portion after said second beam portion passes through said reference cell, said second optical detector emitting a second downstream signal corresponding to the strength of said second beam portion after passing through said reference cell; and

a microprocessor receiving said first and second downstream signals and calculating therefrom ~~the~~ a parameter indicative of the presence of the isotope in the fluid, wherein the parameter comprises enrichment or depletion of the isotope.

2. (Original) The tool according to claim 1 wherein said first and second beam portions comprise a single beam.

3. (Original) The tool according to claim 1 wherein said first and second beam portions comprise separate beams.

4. (Original) The tool according to claim 1 wherein said first fluid volume is contained in a cell.

5. (Original) The tool according to claim 1 wherein said first fluid volume is contained in a conduit.

6. (Original) The tool according to claim 5 wherein the conduit contains flowing fluid.

7. (Original) The tool according to claim 1 wherein said microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

8. (Original) The tool according to claim 1 wherein said microprocessor calculates a quantitative concentration of the isotope in the fluid.

9. (Original) The tool according to claim 1 wherein said laser source is a tunable laser source.

10. (Original) The tool according to claim 1 wherein the carbon isotope is part of a hydrocarbon.

11. (Original) The tool according to claim 1 wherein said first volume and said reference cell are at substantially the same temperature.

12. (Original) The tool according to claim 1 wherein said first volume and said reference cell are in a wellbore when said first and second beam portions pass through said first volume and said reference cell.

13. (Original) The tool according to claim 1 wherein said first volume and said reference cell are not in a wellbore when said beam portions pass through said first volume and said reference cell.

14. (Original) The tool according to claim 1, further including a first upstream detector detecting said first beam portion before said first beam portion passes through said first volume and emitting a corresponding first upstream signal; and a second upstream optical detector detecting said second beam portion before said second beam portion passes through said reference cell and emitting a corresponding second upstream signal.

15. (Original) The tool according to claim 14 wherein said microprocessor receives said first and second upstream signals and uses said first and second upstream signals in calculating said parameter indicative of the presence of the isotope in the fluid.

16. (Original) The tool according to claim 1 wherein said first and second downstream signals are indicative of the transmittance of said first and second beam portions through said sample and reference cells, respectively.

17. (Currently Amended) A method for providing real-time data indicative of the isotopic composition of a hydrocarbon fluid, comprising:

(a) providing a reference fluid having an ~~a known~~ isotopic composition in a reference cell;

(b) defining a sample of the hydrocarbon fluid;

(c) providing at least one laser beam;

(d) normalizing at least one parameter of the reference cell;

(~~d~~e) passing at least a portion of a laser beam through the reference fluid as a reference-measurement beam and measuring said reference-measurement beam after it passes through said reference fluid;

(f~~e~~) passing at least a portion of a laser beam through the sample as a sample-measurement beam and measuring the sample-measurement beam after it passes through the sample; and

(g~~f~~) calculating a parameter indicative of the presence of the isotope in the fluid using measurements made in steps (~~d~~e) and (~~e~~f).

18. (Original) The method according to claim 17 wherein the reference-measurement beam and the sample-measurement beam comprise a single beam.

19. (Original) The method according to claim 17, further including the step of splitting a laser beam to form a reference-measurement beam and a sample-measurement beam, such that the reference-measurement beam and the sample-measurement beam comprise separate beams.

20. (Currently Amended) The method according to claim 17 wherein step (b) comprises placing the sample of the hydrocarbon fluid in a sample cell.

21. (Original) The method according to claim 17 wherein step (b) comprises providing a conduit through which the hydrocarbon fluid flows.

22. (Currently Amended) The method according to claim 17 wherein step (~~e~~f) is carried out while the hydrocarbon fluid is flowing through the conduit.

23. (Currently Amended) The method according to claim 17 wherein in step (~~f~~g) the microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

24. (Original) The method according to claim 17 wherein in step (g) the microprocessor calculates a quantitative concentration of the isotope in the fluid.

25. (Original) The method according to claim 17 wherein said measurements provide information relating to the carbon isotopic composition of individual compounds in a hydrocarbon gas mixture.

26. (Original) The method according to claim 25 wherein the individual compounds are selected from the group consisting of: methane, ethane, propane, iso- and normal butane, and iso- and normal pentane.

27. (Original) The method according to claim 17 wherein the laser beam is provided by a tunable laser source.

28. (Currently Amended) The method according to claim 17 wherein steps (~~d~~e) and (~~e~~f) are carried out at substantially the same temperature.

29. (Currently Amended) The method according to claim 17 wherein steps (~~d~~e) and (~~e~~f) are carried out in a wellbore.

30. (Currently Amended) The method according to claim 17 wherein step (b) is carried out in a wellbore and steps (~~d~~e) and (~~e~~f) are not carried out in a wellbore.

31. (Original) The method according to claim 17 wherein at least one of said first and second beams passes through an upstream detector before passing through a cell.

32. (Currently Amended) The method according to claim 17 wherein step (~~f~~g) is carried out using the transmittance of said reference- and sample-measurement beams through said reference and sample cells, respectively.

33. (New) The tool according to claim 1, wherein the reference cell contains an unknown concentration of the isotope.

34. (New) The tool according to claim 1, wherein the reference cell contains a known concentration of the isotope.

35. (New) The method according to claim 20, wherein step (b) comprises normalizing the at least one parameter of the reference cell to at least one parameter of the sample cell.

36. (New) A tool for determining the amount of a carbon isotope in a fluid, comprising:

a laser source emitting at least one laser beam;

a first volume of the fluid positioned so that at least a first portion of a laser beam passes through the fluid;

a first downstream optical detector positioned to detect said first beam portion after said first beam portion passes through said first volume, said first optical detector emitting a first downstream signal corresponding to the strength of said first beam portion after passing through the first volume;

a reference cell containing a concentration of the isotope and positioned so that at least a second portion of a laser beam passes through said concentration;

a second downstream optical detector positioned to detect said second beam portion after said second beam portion passes through said reference cell, said second optical detector emitting a second downstream signal corresponding to the strength of said second beam portion after passing through said reference cell;

a pre-dilution cell containing a portion of the fluid positioned so that at least a third portion of a laser beam passes through the portion of the fluid;

a third downstream optical detector positioned to detect said third beam portion after said third beam portion passes through said pre-dilution cell, said third downstream optical detector emitting a third downstream signal corresponding to the strength of said third beam portion after passing through the pre-dilution cell; and

a microprocessor receiving said first, second, and third downstream signals and calculating from the first and second downstream signals a parameter indicative of the presence of the isotope in the fluid, and wherein the microprocessor determines from the third downstream signal whether and to what degree to dilute the fluid with a diluent.

37. (New) The tool according to claim 36 wherein said first and second beam portions comprise a single beam.

38. (New) The tool according to claim 36 wherein said first and second beam portions comprise separate beams.

39. (New) The tool according to claim 36 wherein said first fluid volume is contained in a cell.

40. (New) The tool according to claim 36 wherein said first fluid volume is contained in a conduit.

41. (New) The tool according to claim 36 wherein said microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

42. (New) The tool according to claim 36 wherein said microprocessor calculates a quantitative concentration of the isotope in the fluid.

43. (New) The tool according to claim 36 wherein the reference cell contains an unknown concentration of the isotope.

44. (New) The tool according to claim 36, wherein the reference cell contains a known concentration of the isotope.

45. (New) The tool according to claim 36, further including a first upstream detector detecting said first beam portion before said first beam portion passes through said first volume and emitting a corresponding first upstream signal; a second upstream optical detector detecting said second beam portion before said second beam portion passes through said reference cell and emitting a corresponding second upstream signal; and a third upstream optical detector detecting said third beam portion before said third beam portion passes through the pre-dilution cell and emitting a corresponding third upstream signal.

46. (New) The tool according to claim 45 wherein said microprocessor receives said first, second, and third upstream signals and uses said first and second upstream signals in calculating said parameter indicative of the presence of the isotope in the fluid, and wherein said microprocessor uses said third upstream signal in determining whether and to what degree to dilute the fluid with the diluent.

47. (New) The tool according to claim 36 wherein the diluent comprises nitrogen.

48. (New) The tool according to claim 36, wherein the diluent comprises at least one of nitrogen and at least one noble gas.

49. (New) A tool for determining the amount of a carbon isotope in a fluid, comprising:

a laser source emitting at least one laser beam;

a first volume of the fluid positioned so that at least a first portion of a laser beam passes through the fluid;

a first upstream optical detector positioned to detect said first beam portion before said first beam portion passes through said first volume, said first optical detector emitting a first upstream signal corresponding to the strength of said first beam portion before passing through the first volume;

a first downstream optical detector positioned to detect said first beam portion after said first beam portion passes through said first volume, said first optical detector emitting a first downstream signal corresponding to the strength of said first beam portion after passing through the first volume;

a reference cell containing a concentration of the isotope and positioned so that at least a second portion of a laser beam passes through said concentration;

a second upstream optical detector positioned to detect said second beam portion before said second beam portion passes through said reference cell, said second optical detector emitting a second upstream signal corresponding to the strength of said second beam portion before passing through the reference cell;

a second downstream optical detector positioned to detect said second beam portion after said second beam portion passes through said reference cell, said second optical detector emitting a second downstream signal corresponding to the strength of said second beam portion after passing through said reference cell; and

a microprocessor receiving said first and second upstream and downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid.

50. (New) The tool according to claim 49 wherein said first and second beam portions comprise a single beam.

51. (New) The tool according to claim 49 wherein said first and second beam portions comprise separate beams.

52. (New) The tool according to claim 49 wherein said first fluid volume is contained in a cell.

53. (New) The tool according to claim 49 wherein said first fluid volume is contained in a conduit.

54. (New) The tool according to claim 49 wherein said microprocessor calculates a concentration of the isotope in the fluid relative to the concentration of the isotope in the reference cell.

55. (New) The tool according to claim 49 wherein said microprocessor calculates a quantitative concentration of the isotope in the fluid.

56. (New) The tool according to claim 49 wherein the reference cell contains an unknown concentration of the isotope.

57. (New) The tool according to claim 49, wherein the reference cell contains a known concentration of the isotope.

REMARKS/ARGUMENTS

Applicants acknowledge receipt of the Office Action dated July 21, 2003. By virtue of this response, claims 1-57 are pending in the application. Claims 33-57 are newly added, and claims 1, 17, 20, 22, 23, 28-30, and 32 have been amended. Please note that claims 1, 17, 36, and 49 are independent claims. Claims 1-16 are objected to because of informalities in independent claim 1. Claims 1-4, 7-11, 13, 16-20, 23-28 and 32 stand rejected under 35 U.S.C. § 102(b) as being allegedly anticipated by Cooper et al., U.S. Patent No. 5,317,156 ("*Cooper*"). Claims 12, 14, 15, and 29-31 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Cooper*. In addition, claims 5, 6, 21 and 22 stand rejected under 35 U.S.C. § 103(a) as being allegedly unpatentable over *Cooper* in view of Lee et al., U.S. Patent No. 5,445,964 ("*Lee*"). Applicants believe the pending claims are allowable over the art of record and respectfully request reconsideration.

I. The informalities in claims 1-16 are corrected.

The Examiner has objected to claim 1 because it contains the superfluous "the" before "a parameter." The Examiner also objected to claims 2-16, which are dependent upon independent claim 1, because they are dependent upon an objected claim. Applicants have amended independent claim 1 to remove the superfluous "the" before "a parameter." Applicants therefore respectfully request the Examiner to remove the objections to claims 1-16.

II. Claims 1-4, 7-11, 13, 16-20, 23-28 and 32 are not anticipated by *Cooper*.

Applicants respectfully traverse the Examiner's rejections of claims 1-4, 7-11, 13, 16-20, 23-28 and 32 as being allegedly anticipated by *Cooper*. Applicants submit that the claims, as

amended, are not anticipated by *Cooper* because *Cooper* fails to disclose each and every limitation of these claims.

Claims 1 and 17 are independent claims upon which claims 2-4, 7-11, 13, 16, 18-20, 23-28 and 32 depend. Claim 1 has been amended to recite wherein the parameter comprises enrichment or depletion of the isotope. Claim 17 has been amended to recite normalizing at least one parameter of the reference cell. Nothing in *Cooper* teaches or suggests a microprocessor receiving said first and second downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid, wherein the parameter comprises enrichment or depletion of the isotope as set forth in claim 1, as amended. Instead, *Cooper* teaches or discloses an *isotope ratio measurement.* (*Cooper*, claims 1 and 2; col. 1, lines 6-8 and 62-64; col. 4, line 45) One skilled in the art would know that isotopic ratio measurements are a different measurement than measuring isotopic enrichment or depletion. As taught by Applicants' specification, "[t]he reference cell also allows a more accurate determination of isotopic enrichment or depletion relative to the reference gas because the absolute isotopic ratio of the reference gas need not be known." (page 9, para. 29, emphasis added)

In addition, nothing in *Cooper* teaches or suggests normalizing at least one parameter of the reference cell as set forth in claim 17, as amended. Applicants' specification teaches that "the two constants are usually combined and determined experimentally, with known standards substituted into the positions of the sample and reference cell." (page 14, para. 47 to page 15, para. 47) As further taught by Applicants' specification, "[o]nce normalized with one of more standards, the device is ready to make absolute or relative concentration determinations." (page 15, para. 47)

In view of the recitations in claims 1 and 17 that are neither taught nor suggested by *Cooper*, the Applicants respectfully request that the Examiner withdraw the § 102 rejections of these claims and allow these claims. Applicants further request that the Examiner also withdraw the § 102 rejections of dependent claims 2-4, 7-11, 13, 16, 18-20, 23-28 and 32, since it is submitted that independent claims 1 and 17, as amended, are allowable. Dependent claims 2-4, 7-11, 13, 16, 18-20, 23-28 and 32 must *a fortiori* also be allowable, since they carry with them all the limitations of the independent claims to which they ultimately refer.

III. Claims 12, 14, 15, and 29-31 are not unpatentable over *Cooper*.

Applicants respectfully traverse the Examiner's rejections of claims 12, 14, 15, and 29-31 under § 103 as being allegedly unpatentable over *Cooper*. Applicants submit that, contrary to MPEP section 2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the Examiner has failed to cite references that teach or suggest all of the elements recited in the rejected claims.

Claims 12, 14, 15, and 29-31 are all dependent claims, with claims 12, 14, and 15 dependent upon independent claim 1 and claims 29-31 dependent upon independent claim 17. As pointed out in Section II. above, nothing in *Cooper* teaches or suggests a microprocessor receiving said first and second downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid, wherein the parameter comprises enrichment or depletion of the isotope as recited in claim 1, as amended. As further pointed out in Section II. above, nothing in *Cooper* teaches or suggests normalizing at least one parameter of the reference cell as set forth in claim 17, as amended.

Applicants therefore respectfully submit that the Examiner has failed to articulate a *prima facie* case of obviousness in rejecting claims 12, 14, 15, and 29-31, because, contrary to MPEP section 2143, the Examiner has failed to cite references that teach or suggest all of the elements recited in the rejected claims. Since independent claims 1 and 17 are submitted to be allowable, dependent claims 12, 14, 15, and 29-31 must *a fortiori* also be allowable, since they carry with them all the limitations of independent claims 1 and 17, respectively.

IV. Claims 5, 6, 21, and 22 are not unpatentable over *Cooper* in view of *Lee*.

Applicants respectfully traverse the Examiner's rejections of claims 5, 6, 21, and 22 under § 103 as being allegedly unpatentable over *Cooper* in view of *Lee*. Applicants submit that, contrary to MPEP section 2143, the Examiner has failed to make a *prima facie* case of obviousness in rejecting such claims in that the Examiner has failed to cite references that teach or suggest all of the elements recited in the rejected claims.

Claims 5, 6, 21, and 22 are all dependent claims, with claims 5 and 6 dependent upon independent claim 1 and claims 21 and 22 dependent upon independent claim 17. As pointed out in Section II. above, nothing in *Cooper* teaches or suggests a microprocessor receiving said first and second downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid, wherein the parameter comprises enrichment or depletion of the isotope as recited in claim 1, as amended. As further pointed out in Section II. above, nothing in *Cooper* teaches or suggests normalizing at least one parameter of the reference cell as set forth in claim 17, as amended. Therefore, nothing in Cooper teaches or suggests all of the elements of claims 1 and 17, and thus ultimately as recited in claims 5, 6, 21, and 22, respectively.

These missing limitations cannot be supplied by *Lee*. *Lee* teaches a laser spectrometer for analyzing elements within a gas sample that has been passed through a sample cell. (col. 2, lines 65-68) *Lee* also teaches splitting a laser beam and passing it through a reference cell. (col. 7, lines 41-45) Nothing in *Lee* teaches or suggests a microprocessor receiving said first and second downstream signals and calculating therefrom a parameter indicative of the presence of the isotope in the fluid, wherein the parameter comprises enrichment or depletion of the isotope or normalizing at least one parameter of the reference cell. Therefore, nothing in *Lee* teaches or suggests all of the elements of claims 1 and 17, and thus ultimately as recited in claims 5, 6, 21, and 22, respectively.

Applicants therefore respectfully submit that the Examiner has failed to articulate a *prima facie* case of obviousness in rejecting claims 5, 6, 21, and 22, because, contrary to MPEP section 2143, the Examiner has failed to cite references that teach or suggest all of the elements recited in the rejected claims. Since independent claims 1 and 17 are submitted to be allowable, dependent claims 5, 6, 21, and 22 must *a fortiori* also be allowable, since they carry with them all the limitations of independent claims 1 and 17, respectively.

V. New claims 33-57 are allowable.

New claims 33-35 depend upon independent claims 1 and 17, respectively. Since independent claims 1 and 17 are submitted to be allowable, dependent claims 33-35 must *a fortiori* also be allowable, since they carry with them all the limitations of independent claims 1 and 17, respectively.

With regard to new independent claims 36 and 49, Applicants point out that such independent claims 36 and 49 carry additional limitations over claim 1 on which they are

patterned. Therefore, it is respectfully submitted that new independent claims 36 and 49 and new dependent claims 37-48 and 50-57, which depend therefrom, further distinguish over the cited references. Since claim 1, as amended, is respectfully submitted to be allowable, Applicants submit that claims 36 and 49, as well as dependent claims 37-48 and 50-57 must *a fortiori* also be allowable. Therefore, it is submitted that all pending claims are in condition for allowance.

VI. Conclusion

Applicants believe that in view of the foregoing remarks, pending claims 1-57, as amended, are allowable and that the present application is now in full condition for allowance, which action Applicants earnestly solicit. If the Examiner has any questions or comments regarding the foregoing, the Examiner is requested to telephone the undersigned.

In the course of the foregoing discussions, Applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. Moreover, it should be understood that there may be other distinctions between the claims and the prior art which have yet to be raised, but which may be raised in the future.

If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Conley Rose, P.C. Deposit Account Number 03-2769.

Respectfully submitted,

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